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Proposers' Day Announcement

Adaptive Vehicle Make Program Portfolio

Tactical Technology Office
Defense Advanced Research Projects Agency

The Defense Advanced Research Projects Agency (DARPA) will conduct a briefing to the potential proposer community for a series of planned Broad Agency Announcements (BAAs) under the rubric of Adaptive Vehicle Make. Adaptive Vehicle Make is a portfolio of programs that address revolutionary approaches to the design, verification, and manufacturing of complex defense systems and vehicles. The briefing will cover Instant Foundry Adaptive through Bits (iFAB), vehicleforge.mil, Fast Adaptable Next-Generation Ground Combat Vehicle (FANG), and Manufacturing Experimentation and Outreach (MENTOR) efforts and their relationship to the ongoing META program. The Proposers' Day briefing will occur at 11am EDT on Wednesday, September 29, 2010 via live webcast with interactive question capability.

This announcement serves as a notice only and is issued solely for information and planning purposes. Neither the Proposers' Day nor this announcement constitutes a formal solicitation for proposals or proposal abstracts. Participation in the Proposers' Day is voluntary and is not required to propose to any future solicitation. DARPA will not provide reimbursement for any costs incurred to participate in this Proposers' Day.

PROGRAM DESCRIPTION: The ongoing META program seeks to develop model-based methods for the design, representation, and formal verification of complex cyber-electro-mechanical systems such as defense vehicles in a "fab-less" environment. The iFAB effort looks to lay the groundwork for the development of a foundry-style manufacturing capability—taking as input a verified system design specified in an appropriate metalanguage—capable of rapid reconfiguration to accommodate a wide range of design variability and specifically targeted at the fabrication of military ground vehicles.

The principal objective of iFAB—coupled with META—is to enable substantial compression of the time required to go from idea to product through a shift in the product value chain for defense systems from "little m" manufacturing (i.e., fabrication) to the other elements of "big M" Manufacturing (i.e., design, customization, after-market support, etc.). Such a shift requires significant de-coupling of production from the other phases and facets of "big M" Manufacturing so as to enable its commoditization. One might term this the "foundry-style" model of manufacturing. This model is an anathema to the current defense industry trend of tightly coupling design and prototyping through multiple design-build-test-redesign iterations. In fact, the iFAB vision is to move away from wrapping a capital-intensive manufacturing facility around a single defense product, and toward the creation of a flexible, programmable,

potentially distributed production capability capable of accommodating a wide range of systems and system variants with extremely rapid reconfiguration timescales.

The specific goals of the iFAB program are to rapidly design and configure manufacturing capabilities to support the fabrication of a wide array of infantry fighting vehicle models and variants. Parallel efforts titled *vehicleforge.mil* and Fast Adaptable Next-Generation Ground Combat Vehicle (FANG) seek to develop the infrastructure for and conduct a series of design challenges intended to precipitate open source design for a prototype of a next-generation infantry fighting vehicle analogous to the Army's Ground Combat Vehicle (GCV). The iFAB end vision is that of a facility which can fabricate and assemble the winning FANG designs, verified and supplied in a comprehensive metalanguage representation with META tools.

It is anticipated that the iFAB capability is likely to result from the amalgamation of existing fabrication capabilities from a model library that characterizes the salient attributes of each modality of fabrication: cost, speed, range of applicability, speed of reconfigurability, etc. The resultant factory or foundry need not be manifested as a single facility co-resident under one roof. It can be a virtual aggregation of distributed capabilities, sequenced and tied together into a single resultant product flow. The emphasis of the initial, 12-month phase of iFAB will be on tools for foundry design and (re)configuration.

The principal objective of the *vehicleforge.mil* effort is to generate an open source development collaboration environment and website for the creation of large, complex, cyber-electro-mechanical systems by numerous unaffiliated designers—with the goal of democratizing the design innovation process by engaging several orders of magnitude more talent than the current industry model. The initial phase of the program will last 12 months and culminate in the operational deployment of *vehicleforge.mil*. The development of complex software systems has benefitted significantly from the ability to leverage crowd-sourced innovation in the form of open source code development.

Open source software "forge" sites—a key enabler to the success of the open source development paradigm—facilitate collaborative development, source tree maintenance, and version control while allowing participation by a large number of independent programmers. Examples include SourceForge and GNU Savannah. The application of open source methods to the development of electromechanical systems has been more limited. And while one can identify several successful examples, they are largely confined to the development of relatively simple products (e.g., Quirky for consumer product design), or have required significant back-end engineering effort to turn product concepts into detailed designs (e.g., Local Motors for custom cars). *vehicleforge.mil* aims to significantly expand this capability for defense systems by employing a general representation language—being developed under the META program—that is rich enough to describe a broad range of cyber-electro-mechanical systems, yet formal enough that the system can be "compiled" or verified in some manner when a design change is made to some element or aspect of it.

The FANG effort will seek to exercise META, iFAB, and *vehicleforge.mil* capabilities in a series of design challenges of increasing complexity, seeking to leverage fab-less design, foundry-style manufacturing, and a crowd-sourced innovation model—and culminating in a complete design and fabrication of an infantry fighting vehicle in the span of one year.

The parallel Manufacturing Experimentation and Outreach (MENTOR) effort is focused on engaging high school-age students in a series of collaborative design and distributed manufacturing experiments. DARPA envisions deploying up to a thousand computer-numerically-controlled (CNC) additive manufacturing machines—more commonly known as "3D printers"—to high schools nationwide. The goal is to engage students across clusters of schools to collaborate via social networking media to jointly design and build systems of moderate complexity, such as mobile robots, go carts, etc., in response to prize challenges. DARPA is looking for end-to-end concepts for delivering the requisite equipment, training, and software infrastructure to large numbers of high schools, staging and judging of prize challenge competitions, and monitoring various quantitative measures of success of this outreach effort.

PROPOSERS' DAY OVERVIEW: The goals of this briefing are to familiarize participants with DARPA's interest in revolutionary approaches to the design and manufacturing of complex defense systems and to facilitate understanding of future BAAs in this area.

The Proposers' Day briefing will be conducted via live webcast with interactive question capability. The webcast will begin at 11am EDT on Wednesday, September 29, 2010.

DARPA has structured the Adaptive Vehicle Make portfolio as a series of independent solicitations, each consisting of one or more technical areas to facilitate participation by small and non-traditional performers, as well as academic and other not-for-profit institutions. Offerors may choose to respond to only those technical areas that are within their scope of competency. Alternatively, offerors may choose to form teams and propose to multiple portions of the Adaptive Vehicle Make portfolio. International interest and participation are welcome.

To facilitate potential teaming discussions and interchange among the potential proposer community, an online message board/discussion forum will be created. A list of Proposers' Day registrants' contact information will also be made available.

Solicitation will be linked at: http://www.darpa.mil/tto/solicitations.html and will also appear on FedBizOpps at: http://www.fbo.gov. Some of the solicitations may first appear in draft form for comment.

REGISTRATION INFORMATION: Interested parties must register to participate in the interactive webcast, join the online discussion forum/message board, or be placed on the contact info list. DARPA reserves the right to limit the number of participants per organization, but does not presently anticipate doing so.

The registration website is: https://www.schafertmd.com/conference/adaptivemake/

The registration deadline is 1pm EDT, Friday, September 24, 2010.

For assistance with registration or other questions pertaining to the Proposers' Day, please contact:

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